

# CONSTRUCTION OF HOLLOW REINFORCED CONCRETE BLOCK

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**Abstract:-** Eco Houses are basically Green Buildings only but of a smaller scale. And emphasis is given for it to be budget friendly for a normal family of four. To make it budget friendly importance is given to the right selection of materials to be used for construction which should not only provide stability and durability to the structure but should be economical and environmentally friendly as well.

This method is called **Reinforced Concrete Block Masonry method (R.C.B)**.

Air is freely available, and Hollow Concrete Blocks consist of 50% of hollow i.e. air and hence when a structure is built by this method, the cost of construction is slashed down and Eco-friendly as it SAVES 100 % bricks, 50 % steel + shuttering, 40 % concrete, 25 % utility bill.'

**Keywords:** hollow concrete blocks, eco houses, reinforced concrete block masonry, environment friendly

## I - INTRODUCTION

Now days, hollow concrete blocks and bricks are becoming very popular. These blocks are being widely used in construction of residential buildings, factories and multi-storied buildings. These hollow blocks are commonly used in compound walls due to its low cost. These hollow blocks are more useful due to its lightweight and ease of ventilation. The blocks and bricks are made out of mixture of cement, sand and stone chips. Hollow blocks construction provides facilities for concealing electrical conduit, water and soil pipes. It saves cement in masonry.

Hollow blocks are the most common types of concrete blocks, having one or more holes that are open at both

Sides. The total void area can amount to 50 % of the gross cross-sectional area

The main objective is the "comparison of normal hollow concrete block with that of a reinforced hollow concrete reinforced block." The reinforced block must have a greater compressive strength lesser weight with less cost than the normal block.

It has got a lot of Advantages also such as :-

- **Earthquake resistant:** Load bearing concrete blocks can be designed to be wind, earthquake resistant too.
- **Fire Proof:** Due to concrete block & 3" cover to steel, rusting is minimized & such buildings are fire & bomb last proof.
- **Durable:** Concrete blocks are attractive, durable and have excellent thermal, acoustic properties. No repair like R.C.C. is needed in every ten years.
- **Speed of construction:** No heavy equipment needed on site, less form-work, less steel so construction is simple, speedier & hence economical.
- **Architecture:** Ancient type of architectural elevation is also possible by R.C.B type of construction.

## 2 - MATERIAL AND DESIGN METHODOLOGY

### 2.1. Materials

The properties of material used for making concrete mix are determined in laboratory as per relevant codes of practice. Different materials used in present study were cement, coarse aggregates, and fine aggregates, in addition to reinforcement bars.

The Methodology adopted is conventional tests on a Unreinforced HCB and then Reinforced Hollow Concrete Block Masonry.

**Ordinary Portland cement** - Ordinary Portland cement of grade 43 was used in concrete. OP cement does not contain any pozzolanic material. Consistency of Cement was found to be 29% and it was well sound with a tensile strength of 3.8 N/mm<sup>2</sup> after 7 days and compressive strength of 48 N/mm<sup>2</sup> after 28 days.

### Aggregates -

- Fine aggregate: fine aggregate was used locally available. It was sieved through 2.36mm IS sieve. Fineness modulus was 2.59, and of zone - II
- Coarse aggregate: broken granite rocks of size 10mm and 20mm which were used, of abrasion value of 30%, crushing value of 47.4%

Reinforcement: steel bars of 8mm diameter were used.

### 2.2. Methodology

The tests on cement, sand and aggregates need to be done to check the suitability of material.

The concrete of grade M5, M10, M15 and M20 is to be made for each case.

The aggregates passing through 20mm and 6.5mm is taken in the ratio 60:40(coarse: fine)

Firstly, the aggregates passing through 20mm is put in each mould and the cubes are

Casted and then the cubes with reinforcement provided are also casted. Then the same process is repeated for aggregates passing through 6.5mm sieve. The comparisons are made between the block with the reinforcement and without. Reinforcement in terms of strength, cost and weight.

Firstly, all the equipment's were assembled namely

1. The Moulds of different sizes:

- 400 x 200 x 200 mm
- 400 x 200 x 300 mm
- 400 x 200 x 400 mm

2. Moulds for Cavity

3. Aggregates

4. Steel mesh 7 x 7 ft.

5. Reinforcement bars of diameter 8 mm

6. Thermocol for cavity.

- Firstly, the concrete of grade M5 is manufactured and the tests were conducted on it and by altering the thickness in each case as 20 mm 30 mm and 40 mm.
- The same steps were done for the grades of concrete of M10 M15 and M20.
- The blocks were made without reinforcement first and then the reinforcement in the form of mesh was provided.
- The curing was done for 7 days and 28 days and the results are taken at the end of 4 weeks.
- The blocks were disintegrated in the case of thickness of 20mm and 30mm without reinforcement **due to lack of cover.**
- Disintegration and Spalling was seen in the blocks.
- The block with 40mm thickness is sustained.
- The blocks with reinforcement were disintegrated in all the cases.
- Hence the blocks were not fit.
- **Therefore the minimum slab thickness is 40 mm for any grade of concrete.**

### 3 - TEST RESULTS AND ANALYSIS

#### A) For tests of raw material

- The consistency of cement 29 %
- The initial and final setting time of cement 30 min and 630 min
- The Soundness of cement 1 mm
- The specific gravity of cement 3.18
- The Tensile strength 3.8 N/mm<sup>2</sup>
- The Bulking of sand 25 %
- The specific gravity of Fine Aggregate 2.67
- The crushing Value 47.4 %
- The Impact Value 17.4 %

The concrete was made and the slump was recorded as 20 mm

**a) For Normal Concrete (without reinforcement)**

Grades	Thickness (mm)		
	20	30	40
M5	Disintegrated	Disintegrated	Sustained
M10	Disintegrated	Disintegrated	Sustained
M15	Disintegrated	Disintegrated	Sustained
M20	Disintegrated	Disintegrated	Sustained

**b) For Reinforced Concrete**

Grades	Thickness (mm)		
	20	30	40
M5	Disintegrated	Disintegrated	Disintegrated
M10	Disintegrated	Disintegrated	Disintegrated
M15	Disintegrated	Disintegrated	Disintegrated
M20	Disintegrated	Disintegrated	Disintegrated

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**4 - CONCLUSIONS**

The Tests conducted on cement, and aggregates were performed and the results were found at par with the standard results. Thus, the suitability of the raw materials used in construction was confirmed.

The comparative analysis of the types of blocks for each case is done by varying the thickness of the blocks and providing reinforcement for one case and without reinforcement for the other case.

Thus the test results confirm that the grade of the concrete does not have any impact on the sustainability of the concrete and it only depends upon the thickness of the concrete slab between the mould cavity and the edge of the mould.